



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005SD37B

Title: Development of an Agglomeration Process to Increase the Efficiency of Limestone-Based Material to Remove Metals from Drinking Water

Project Type: Research

Focus Categories: Toxic Substances, Treatment, Water Supply

Keywords: metals, metals contamination, lead, cadmium, arsenic, metals removal, drinking water, water treatment, granulation, agglomeration, point of entry systems

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Congressional District: First

Principal Investigators:

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Abstract

Metals contamination of drinking water is a major problem facing many areas of the United States and the world. There is a need for an inexpensive remediation technology for the removal of metals in drinking water that can be applied to small rural water systems. This research will focus on the development of a process for removal of select metals from drinking water by limestone-based material. Metals in drinking water considered for this research include lead, cadmium, and arsenic.

Lead is a well-known toxin that causes delays in the physical and mental development of children that are exposed to elevated levels. The action limit for lead is 15 ppb. Cadmium is a persistent and bioaccumulative toxic metal. Long-term exposure has the potential to cause kidney, liver, bone, and blood damage. The maximum contaminant level for cadmium is 5 ppb. Arsenic is a persistent, bio-accumulative toxin. The maximum

contaminant level for arsenic, formerly 50 parts per billion (ppb), will be lowered to 10 ppb by 2006 because of links to cancer.

Limestone-based material has demonstrated the potential to reduce select metals (lead, cadmium, and arsenic) in drinking water, with the additional benefit of low-cost disposal of a stable waste product in ordinary landfills. Earlier research by the principal investigators using limestone-based material as an adsorbent for drinking water treatment has clearly shown that this material can achieve metals removal of greater than 90 percent.

This project will investigate techniques to improve removal efficiency of limestone-based material through agglomeration. Agglomeration is the process of taking fine materials and forming them into spherical granules. Additives that enhance metals removal can also be added to the limestone material during agglomeration. A binder is added to the material mix to bond the individual particles together and to strengthen the granules. Agglomeration significantly increases material surface area without compromising flow through rates.

This research will assist in the development of a granular adsorbent product that will remove metals and that can be manufactured and sold for use at the drinking water source, at point-of-use, or at point-of-entry. Limestone is readily available and its use for metals removal is relatively inexpensive. The technology will be adapted to small, rural water supply systems. Benefits of this research will include a low-cost treatment technology for source reduction that will reduce select metals to below drinking water standards.

The specific objectives of this work are to:

- 1) Develop and test an agglomeration process for granulating limestone-based material as filter media for metals adsorption.
- 2) Develop a mixture formula and manufacturing process for the granules and produce sufficient quantities for use in batch and column experiments.
- 3) Investigate the efficiency of the manufactured granules to remove metals (lead, cadmium, and arsenic) using batch and column experiments.